

ABSTRACT

Disclosed herein is an entirely new and improved method for generating Boolean set intersection and set union among two regions defined by a quadtree-indexed vector representation of data point tuples using a digital computer. Indexing cells are established about the two regions, and interactions between indexing cells are classified as follows: interactions between two interior cells (“Interior x Interior” indexing cells), interactions between a boundary and an interior cell (“Interior x Boundary” indexing cells), and interactions between two boundary cells (“Boundary x Boundary”) indexing cells. The present method focuses on the latter class which is considerably more complex. Four separate pseudo points are defined for each Boundary x Boundary indexing cell, one where each of the two regions enter and exit the boundary indexing cell. Next, each Boundary x Boundary indexing cell is categorized based on the relationship of its pseudo points, and one of the two regions is selected (based on the canonical form category of that cell) to be a starting region. Given the starting (feature, tuple) region, the set operation is performed by “tracing” (accumulating tuples along the boundary of) the starting (tuple, feature) region until an intersection of the boundaries of said two regions occurs, then accumulating tuples associated with the other region, and so on, switching at each intersection until the indexing cell is traversed. Given the set of included tuples from Boundary x Boundary indexing cells, it is a simple task to combine the result with the set operations on Interior x Interior indexing cells and Interior x Boundary indexing cells in a known manner to produce a complete union or intersection. The method capitalizes on the efficiencies gained by quadtree-indexed vector representation and yields enormous improvement in efficiency over existing computational methods.